3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR 036L Toxicological Assessment Using Grab Sample Container
Sponsor:	Medical Operations
Discipline:	Environmental Health
Category:	Medical Requirements
References:	ISS Medical Operations Requirements Document SSP 50260
Purpose/Objectives:	Preflight module offgassing assesses the projected accumulation of volatile organic contaminants in the ISS module between closeout and crew entry on orbit. Determine and assess crew exposure to volatile organic contaminants in the air on ISS, based on postflight analyses of in-flight Grab Sample Container samples.
Measurement Parameters:	Identities of airborne volatile organic compounds and their concentrations.
Deliverables:	Preflight module offgas report evaluating the rate of accumulation of detected volatile organic compounds based on the collection and analyses of samples using evacuated containers. Postflight report evaluating the concentrations of detected volatile organic compounds in the spacecraft air based on the collection and analyses of archival air samples in Grab Sample Containers.
Flight Duration:	≥ 30 days
Number of Flights:	Every ISS Increment
Number and Type of Crew Members Required:	Two crew members are trained in Environmental Health System (EHS) activities. One EHS crew member will perform the in-flight activity.
Other Flight Characteristics:	N/A

3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

<table>
<tr><td rowspan="2">Preflight Training Activity
Description:</td><td colspan="4">Two crew members will be trained in Environmental Health System (EHS) activities.
Training/Familiarization will be covered under the following EHS documents and lessons:
EHS Toxicology Operations</td></tr>
<tr><td>Schedule:</td><td>Duration:</td><td>Schedule:</td><td>Flexibility:</td><td>Personnel Required:</td></tr>
<tr><td></td><td>EHS Toxicology Operations
Inexperienced crewmember 60 min.
Experienced crewmember 30 min</td><td>L-12 months</td><td>N/A</td><td>Crewmembers/Instructors</td></tr>
<tr><td rowspan="2">Ground Support Requirements Hardware/Software</td><td>Preflight Hardware:</td><td colspan="2">Preflight Software:</td><td>Test Location:</td></tr>
<tr><td>Grab Sample Containers</td><td colspan="2">N/A</td><td>U.S.</td></tr>
<tr><td rowspan="4">Training Facilities</td><td>Minimum Room Dimensions:</td><td>Number of Electrical Outlets:</td><td>Temperature Requirements:</td><td>Special Lighting:</td></tr>
<tr><td>8 X 10</td><td>None</td><td>Ambient</td><td>No</td></tr>
<tr><td>Hot or Cold Running Water:</td><td>Privacy Requirements:</td><td colspan="2">Other:</td></tr>
<tr><td>No</td><td>Private room free from any distractions.</td><td colspan="2">N/A</td></tr>
<tr><td>Constraints/Special Requirements:</td><td colspan="4">None</td></tr>
<tr><td>Launch Delay Requirements:</td><td colspan="4">Refresher training is conducted at crew member request.</td></tr>
<tr><td>Notes:</td><td colspan="4">Experienced crewmember – had training within the last 1½ yrs.
EHS Toxicology Operations includes training for GSC, CSA-CP, FMK, CDMK, and DST.</td></tr>
</table>

3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

<table>
<tr><td>Preflight Activity
Description:</td><td colspan="5">Monitoring of ISS Modules:
Prior to launch on U.S. vehicles all pressurized modules destined for human habitation shall undergo atmospheric offgas testing with periodic sampling using evacuated containers.

Once the module is at a predetermined level of configuration, air samples of the module can be obtained. The ground-based test duration is determined by the estimated length of time that the module is sealed from the module close-out on the ground to crew entry of the module in space. Details and requirements for the module offgas test are contained in Qualification and Acceptance Environmental Testing Requirements, SSP 41172, Section 5.

JSC personnel in coordination with KSC and the MMOP Air Quality Subgroup shall determine the quantity and frequency of collection of air samples, test procedures and methods, timing of the test, and other detailed logistics. The results of the tests should be submitted to the Subgroup as soon as available so that the crew’s first entry procedures may be developed.</td></tr>
<tr><td>Schedule:</td><td>Duration:</td><td>Schedule:</td><td>Flexibility:</td><td>Blood Volume:</td><td>Personnel Required:</td></tr>
<tr><td></td><td>5 min/sample</td><td>Sampling performed when module reaches predetermined level of configuration.</td><td>N/A</td><td>N/A</td><td>JSC Toxicology personnel in coordination with KSC.</td></tr>
<tr><td>Ground Support Requirements Hardware/Software</td><td colspan="2">Preflight Hardware:</td><td colspan="2">Preflight Software:</td><td>Test Location:</td></tr>
<tr><td></td><td colspan="2">Evacuated Containers</td><td colspan="2">N/A</td><td>U.S.</td></tr>
<tr><td>Testing Facilities</td><td>Minimum Room Dimensions:</td><td>Number of Electrical Outlets:</td><td>Temperature Requirements:</td><td colspan="2">Special Lighting:</td></tr>
<tr><td></td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="2">N/A</td></tr>
<tr><td></td><td>Hot or Cold Running Water:</td><td>Privacy Requirements:</td><td>Vibration/Acoustic Isolation:</td><td colspan="2">Other:</td></tr>
<tr><td></td><td>N/A</td><td>N/A</td><td>N/A</td><td colspan="2">The JSC Toxicology Laboratory is required to provide off-gas sample processing and analyses.</td></tr>
<tr><td>Constraints/Special Requirements:</td><td colspan="5">Detailed logistics (quantity & frequency of sampling) will be determined among personnel and MMOP.</td></tr>
<tr><td>Launch Delay Requirements:</td><td colspan="5">The GSC shelf life will be evaluated following any major delay to ensure that the 6-month life will not be exceeded.</td></tr>
<tr><td>Notes:</td><td colspan="5">None</td></tr>
<tr><td>Data Delivery</td><td colspan="5">Data/Report to Designated Recipients (Nominal/Contingency):</td></tr>
<tr><td></td><td colspan="5">The Toxicology Laboratory will submit a report before launch assessing the air quality in the module to the Air Quality Subgroup members of the MMOP, Crew Surgeon, and the Environmental Health Working Group Chairperson in the MMOP within 1 month following receipt of the last module sample.</td></tr>
</table>

3.5 In-Flight Activities

TABLE 3.5.1a: IN-FLIGHT ACTIVITIES - GSC Archival Sampling – includes unstow, deploy, and stow.

<table>
<tr><td>In-Flight Activity
Description:</td><td colspan="3">One crew member will be operator. After unstowing and prior to deployment, the date, time, and sampling location are recorded on the label affixed to each Grab Sample Container. One container is used at each designated sampling location as defined in the in-flight schedule. GSC samples should be collected centrally along the mid-axes of the module.
A minimum quantity of 3 contingency GSCs (excluding those planned for nominal sampling) will be available in the event there is an air quality concern or issue.</td></tr>
<tr><td rowspan="2">Schedule:</td><td>Duration:</td><td>Schedule:</td><td>Personnel Required:</td></tr>
<tr><td>GSC Archival Sampling – Unstow & Stow – 5 min
5 min/sample</td><td>-Once per month in each major module (FGB, Lab, Service Module). Additional sampling locations may be added, as necessary, to characterize the air quality throughout ISS.
-At 1st entry for each new module.</td><td>1 Operator</td></tr>
<tr><td>Procedures:</td><td colspan="3">Procedures are contained within the System Operation Data File (SODF) Med Ops book:
• Grab Sample Container Operations
A label on the GSC also lists the stepwise procedures for operation.</td></tr>
<tr><td>Constraints / Special Requirements:</td><td colspan="3">• GSC collections should be taken centrally located along the mid-axis of the module.
• The container should be held away from the body during sample collection.
• GSC sampling should be coordinated with FMK & VOA during common sampling sessions.
• Additional GSC samples may be collected in response to air quality issues in a contingency situation.</td></tr>
<tr><td>Photo / TV Requirements:</td><td colspan="3">Photo documentation is required during contingency situations.</td></tr>
<tr><td>Cold Stowage Requirements:</td><td colspan="3">N/A</td></tr>
<tr><td>Mission Extension Requirements:</td><td colspan="3">N/A</td></tr>
<tr><td>Landing Wave-Off Requirements:</td><td colspan="3">N/A</td></tr>
<tr><td rowspan="2">Data Delivery</td><td colspan="3">Data/Report to Designated Recipients (Nominal/Contingency):</td></tr>
<tr><td colspan="3">See Table 3.6 Postflight Activities for GSC archival samples Data Delivery</td></tr>
</table>

TABLE 3.5.1b IN-FLIGHT ACTIVITIES – Contingency Grab Sample Container Sampling

In-Flight Activity **Description:**	Contingency Grab Sample Container Sampling		
Schedule:	Duration	Schedule	Personnel Required
	Unstow & Stow – 5 min 5 min/sample	As needed	1 Operator
Procedures:	Procedures are contained within the System Operation Data File (SODF) Med Ops book: • Grab Sample Container Operations A label on the GSC also lists the stepwise procedures for operation.		
Constraints / Special Requirements:	• Additional GSC samples may be planned for and collected in response to air quality issues • When air quality is a concern or issue as requested by Crew Surgeon • A minimum of 3 GSCs must be available to the ISS crew for contingency response		
Photo/TV Requirements:	As needed		
Cold Stowage Requirements:	N/A		
Mission Extension Requirements:	N/A		
Landing Wave-Off Requirements:	N/A		
Data Delivery	**Data/Report to Designated Recipients (Nominal/Contingency):**		
	A preliminary report will be provided within 1 week postflight following receipt of contingency samples.		

TABLE 3.5.1c IN-FLIGHT ACTIVITIES – Photos of Grab Sample Container Activity

In-Flight Activity **Description:**	Photos of Grab Sample Container Activity		
Schedule:	Duration	Schedule	Personnel Required
	5-10 min. Depends upon camera location	During contingency situation	1 – 2 Operators
Procedures:	Procedures are contained within the System Operation Data File (SODF) Photo/TV – Generic book.		
Constraints / Special Requirements:	Photo of activity should be at a distance to give reasonable perspective of sampling area.		
Cold Stowage Requirements:	N/A		
Mission Extension Requirements:	N/A		
Landing Wave-Off Requirements:	N/A		
Data Delivery	**Data/Report to Designated Recipients (Nominal/Contingency):**		
	N/A		

In-Flight Activities, (cont.)

TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name	P/N
Grab Sample Container (GSC)	SDD46108778-XXX

3.6 Postflight Activities

TABLE 3.6: POSTFLIGHT ACTIVITIES

Postflight Activity Description:	The GSC samples collected in-flight are analyzed postflight by the JSC Toxicology Laboratories.			
	Duration:	**Schedule:**	**Flexibility:**	**Personnel Required:**
Schedule:	N/A	N/A	N/A	N/A
Ground Support Requirements Hardware/Software	**Postflight Hardware:**	**Postflight Software:**	**Test Location:**	
	N/A	N/A	N/A	
Testing Facilities	**Minimum Room Dimensions:**	**Number of Electrical Outlets:**	**Temperature Requirements:**	**Special Lighting:**
	N/A	N/A	N/A	
	Hot or Cold Running Water:	**Privacy Requirements:**	**Vibration/Acoustic Isolation:**	**Other:**
	N/A	N/A	N/A	N/A
Constraints/Special Requirements:	Stowage temperatures during transport should not exceed 110°F.			
Early Destow / Early Return:	*The GSC samples collected during nominal operations are required to be destowed from the orbiter within R+3 hours to ensure the prompt return of the samples to the JSC Toxicology Laboratory for analyses within 48 hours. The GSC early-return contingency samples from an air quality incident (i.e., fire) are required to be destowed from the orbiter within R+3 hours to ensure the prompt return of the contingency samples to the JSC Toxicology Laboratory within 24 hours.			
Notes:	EB is responsible for the early return of samples to JSC.			
Data Delivery	**Data/Report to Designated Recipients (Nominal/Contingency):**		**Mission Summary Report:**	**Data Archives:**
	• A preliminary report will be provided within 1 week following receipt of contingency samples. • If the analysis of an environmental contaminant(s) indicates an elevation or trend, then Toxicology will notify the Contingency Action Team, which includes the ISS Increment Lead Crew Surgeon who will in turn notify the appropriate Increment Crew Surgeon.		A final report will be posted to the Toxicology Website no later than 3 months after return of samples.	See Mission Summary Report.

3.7 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training				
EHS Toxicology Operations:	Inexperienced crewmembers 60 min. Experienced crewmembers 30 min	L-12 months	Instructors/Crew members	None
Preflight Activity				
Module Off-gassing: Atmospheric sampling of module using evacuated containers.	5 min/sample	Sampling done when module reaches predetermined level of configuration.	JSC Tox. Personnel in coordination with KSC.	Detailed logistics (quantity & frequency of sampling) will be determined among personnel and MMOP.

ACTIVITY	DURATION OF ACTIVITY	SCHEDULE	PERSONNEL REQUIRED	CONSTRAINTS
In-Flight Activity				
Grab Sample Container Archival Sampling	Unstow & Stow – 5 min 5 min./sample	-Once per month in each major module (FGB, LAB, Service Module). Additional sampling locations may be added, as necessary, to adequately characterize the air quality throughout ISS. -At 1st entry for each new module.	1 Operator	GSC collections should be taken centrally located along the mid-axis of the module. The container should be held away from the body during sample collection. GSC sampling should be coordinated with FMK & VOA sessions during common sampling sessions. Additional GSC samples may be collected in response to air quality issues in a contingency situation.
Contingency Grab Sample Container Sampling	Unstow & Stow – 5 min 5 min/sample	As needed	1-2 Operators	-Additional GSC samples may be planned for and collected in response to air quality issues. -When air quality is a concern or issue as requested by Crew Surgeon. -A minimum of 3 GSCs must be available to the ISS crew for contingency response.
Photos of Grab Sample Container Activity	5-10 min Dependent upon camera location	During contingency situation	1-2 Operators	Photo of activity should be at a distance to give reasonable perspective of sampling area.
Wheels-Stop: N/A				
Postflight: N/A				
Postflight Debrief:				
Debrief	No extra time	~R+30 days	Crew members/ Toxicology Team	Included as part of the MedOps overall debrief.